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Unpacking the impact of adverse childhood experiences on adult mental health[★]

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Abstract

Exposure to childhood adversity has an impact on adult mental health, increasing the risk for depression and suicide. Associations between Adverse Childhood Experiences (ACEs) and several adult mental and behavioral health outcomes are well documented in the literature, establishing the need for prevention. The current study analyzes the relationship between an expanded ACE score that includes being spanked as a child and adult mental health outcomes by examining each ACE separately to determine the contribution of each ACE. Data were drawn from Wave II of the CDC-Kaiser ACE Study, consisting of 7465 adult members of Kaiser Permanente in southern California. Dichotomous variables corresponding to each of the 11 ACE categories were created, with ACE score ranging from 0 to 11 corresponding to the total number of ACEs experienced. Multiple logistic regression modeling was used to examine the relationship between ACEs and adult mental health outcomes adjusting for sociodemographic covariates. Results indicated a graded dose-response relationship between the expanded ACE score and the likelihood of moderate to heavy drinking, drug use, depressed affect, and suicide attempts in adulthood. In the adjusted models, being spanked as a child was significantly associated with all self-reported mental health outcomes. Over 80% of the sample reported exposure to at least one ACE, signifying the potential to capture experiences not previously considered by traditional ACE indices. The findings highlight the importance of examining both cumulative ACE scores and individual ACEs on adult health outcomes to better understand key risk and protective factors for future prevention efforts.

[★]The findings and conclusions in this paper are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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Conflicts of interest

None to declare.

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Exposure to early adversity can compromise lifelong and even intergenerational health and wellness (Schofield, Lee, & Merrick, 2013). The relationship between childhood adversity and mental health is of particular interest to the field of public health due to both the magnitude and effects of mental illness in adulthood. For example, depression is a large contributor to morbidity and mortality (Papakostas, 2009), and remains one of the most common types of mental illness, with 11.4% of Americans aged 12–17 years and 6.6% of adults aged 18 or older having reported a major depressive episode (Center for Behavioral Health Statistics and Quality, 2015). Jia, Zack, Thompson, Crosby, and Gottesman (2015) estimated an average loss of 28.9 years of quality-adjusted life expectancy for depressed individuals, which by comparison is at least twice the burden of several chronic conditions, such as stroke, heart disease, diabetes mellitus, hypertension, and asthma. Depression is also a leading risk factor for suicide (Li, Page, Martin, & Taylor, 2011), which is one of the leading causes of death in the United States for all ages (Centers for Disease Control and Prevention, 2015). Suicide rates have increased from 1999 to 2014 across most sectors of society (Curtin, Warner, & Hedegaard, 2016) resulting, too, in incalculable emotional and human costs. Together, these findings highlight the need to prioritize prevention strategies for individuals at risk for depression and suicide. As such, upstream prevention strategies, or activities that aim to prevent the occurrence of risk, may benefit from more rigorous examinations of the links among adult depression and suicide and childhood adversity.

Much of what is known about the long-term impacts of childhood adversity comes from the landmark CDC-Kaiser Permanente Adverse Childhood Experiences (ACE) Study (Felitti et al., 1998), and subsequent studies using ACE data collected on the Behavioral Risk Factor Surveillance System (BRFSS). Typically, ACE studies utilize a cumulative index that combines both child abuse and child neglect ACEs (i.e., physical abuse, emotional abuse, sexual abuse, physical neglect, and emotional neglect) with ACEs related to household challenges (i.e., exposure to mother being treated violently, parental divorce or separation, parental incarceration, a household member with substance abuse problems, and a household member with mental illness; Brown et al., 2009; Felitti et al., 1998; Gilbert et al., 2015; Metzler, Merrick, Klevens, Ford, & Ports, 2017). This summary index – frequently referred to as an ACE score – is computed for each participant and measures the total number of ACEs experienced within the first 18 years of life. ACE studies have revealed that ACEs are common, with approximately two-thirds of individuals experiencing at least one ACE (Felitti et al., 1998; Gilbert et al., 2015). Not only are ACEs common, but they are also associated with future violence and victimization, health risk behaviors, chronic health conditions, mental illness, decreased life potential, and premature death (Brown et al., 2009; Felitti et al., 1998; Gilbert et al., 2015; Metzler et al., 2017) in a dose-response pattern – as an individual's ACE score or exposure to childhood adversity increases, their risk for experiencing poorer adult outcomes also increases.

Exposure to child abuse and neglect and other early adversities is a well-documented and understood risk factor for adult mental health functioning. A host of studies using the original CDC-Kaiser Permanente data have linked ACE score to depressed affect and depression (Anda et al., 2002; Chapman et al., 2004; Edwards, Holden, Felitti, & Anda, 2003), suicidality (Dube et al., 2001), and impaired work performance (Anda et al., 2004). The relationship between ACE score and depressive symptoms is also found using more representative state-level BRFSS data (Gilbert et al., 2015; Remigio-Baker, Hayes, & Reyes-Salvail, 2014). Furthermore, exposure to early adversity and other forms of toxic stress is linked to impaired physiological responses, including impaired stress response (Shonkoff et al., 2012), which can in turn contribute to impaired mental health and wellbeing.

Associations between childhood adversity and behavioral risk factors associated with mental illness are also well established. Harmful behaviors, such as smoking and drinking and other substances, often serve as a means of coping with stress due to their ability to alleviate negative mood states (Dembo, Williams, Wothke, Schmeidler, & Brown, 1992; Douglas et al., 2010; Kassel, Jackson, & Unrod, 2000; Kendler et al., 2000; Pomerleau & Pomerleau, 1987). Further, childhood adversity increases the risk of nicotine dependence (Xie et al., 2012). As the number of ACEs increases, the risk of alcohol problems (Anda et al., 2002) and smoking (Anda et al., 1999) during adulthood also increases.

Whereas the associations between an overall index such as ACE score and adult mental and behavioral health have been documented (e.g., Hughes, Lowey, Quigg, & Bellis, 2016), less is known about the unique contribution that each underlying ACE has on long-term mental and behavioral outcomes. For example, although studies have found the link between childhood sexual abuse experiences and subsequent mental health, several such studies do not have information on additional adverse experiences from which to fully examine the relative contributions (e.g., Easton & Kong, 2016; Spataro, Mullen, Burgess, Wells, & Moss, 2004). The current study seeks to deconstruct the relationship between ACE score and mental health outcomes in adulthood by examining each ACE separately. Such investigations have the potential to inform prevention efforts such that they can be tailored to address specific childhood adversities, thereby minimizing the impact of those experiences on later health and well-being.

In addition to deconstructing the relationship between ACEs and mental health, this study includes an expanded ACE index inclusive of the experience of being spanked as a child. The effectiveness of spanking as a disciplinary practice has been contested, as spanking has been linked with several short and long term detrimental consequences to children's mental, physical, and behavioral health (Gershoff & Grogan-Kaylor, 2016). These outcomes are similar to the ones previously linked with ACEs (Brown et al., 2009; Felitti et al., 1998), including anxiety disorders, alcohol abuse or dependence, externalizing problems (MacMillan et al., 1999; Taylor, Manganello, Lee, & Rice, 2010), and depressive symptoms (Christie-Mizell, Pryor, & Grossman, 2008). Researchers have encouraged the use of expanded ACE indices, including items such as community violence (Cronholm et al., 2015), peer victimization (Finkelhor, Shattuck, Turner, & Hamby, 2013), and spanking (Afifi et al., in press) to provide a more complete picture of childhood adversity. Studies utilizing data from the CDC-Kaiser ACE study are limited in regards to the inclusion of additional

ACEs, because the survey was established in the mid-1990s, and data collection for that study has ended. However, questions pertaining to being spanked as a child were included in the survey instrument used in the original ACE study. A recent study by Afifi et al. demonstrated that the inclusion of the spanking item assessing the respondent's exposure to spanking was appropriate to include in an expanded ACE index, as exposure to being spanked has a unique effect on adult health outcomes outside of the traditional ACE index (Afifi et al., in press).

In the present paper, data from the CDC-Kaiser ACE Study were used to:

1. Identify the relationship between an expanded, cumulative ACE score that includes spanking in addition to the ten original ACEs; and
2. Determine the individual and collective contribution of each ACE to the prediction of adult mental and behavioral health problems.

1. Method

1.1. Data and sample

Data for this study were drawn from Wave II of the CDC-Kaiser ACE Study collected in 1997. The ACE Study protocol was approved by the Institutional Review Boards of the Southern California Permanente Medical Group (Kaiser Permanente), the Emory School of Medicine, and the Office of Protection from Research Risks, National Institutes of Health. The sample consisted of adult members of Kaiser Permanente, a large healthcare maintenance organization, in southern California seeking routine health checks at an outpatient clinic ($N = 7465$). The majority of the sample was Caucasian (75.2%) followed by 10.7% Hispanic, 7.6% Asian, 4.1% Black, and 2.4% other races or ethnicities. Over half of the participants (53.3%) were females; respondent ages ranged from 19.0 to 97.6 years ($M = 55.4$, $SD = 15.0$). Recruitment and participant demographics have been explained in detail elsewhere (Felitti et al., 1998). See Table 1 for additional information about demographics and ACE prevalence.

1.2. Measurements

1.2.1. Adverse Childhood Experiences (ACEs)

1.2.1.1. ACEs: The Family Health History questionnaire used in the original ACE study (Felitti et al., 1998) consists of multiple items assessing exposure to the 10 traditional ACEs including abuse (i.e., sexual, emotional, and physical), neglect, (i.e., physical and emotional), and household challenges (i.e., mother treated violently, household mental illness, incarcerated family members, household substance abuse, parental separation/divorce) experienced during the first 18 years of life, as well as being spanked as a child. These items were selected and adapted from validated clinical measures of sexual history, violence, and traumatic childhood experiences, including Wyatt's 1985 paper (Wyatt, 1985), the Conflict Tactics Scales (CTS; Straus & Gelles, & Smith, 1990) and the Childhood Trauma Questionnaire (CTQ; Bernstein et al., 2003). Dichotomous (yes/no) exposure variables corresponding to each of the original 10 ACE categories (e.g., during the first 18 years of life, did anyone in your household ever go to prison, was anyone in your household

depressed or mentally ill?) plus the 1 additional spanking item were created using definitions used in previously published ACE Study manuscripts (Afifi et al., in press; Dong et al., 2004; Felitti et al., 1998). A single item on the survey assessed the experience of being spanked. The preface to the question is: “Sometimes parents spank their children as a form of discipline. While you were growing up during your first 18 years of life how often were you spanked?” Five response options were available: (1) never spanked; (2) spanked once or twice throughout childhood; (3) spanked a few times a year; (4) spanked many times a year; and (5) spanked weekly or more. Spanking was coded as “yes” if the respondent reported being spanked a few times per year, many times per year, or weekly or more.

1.2.1.2. ACE core: A composite score was created for each participant by summing the 11 constructed ACE variables. ACE score values ranged from 0 to 11 corresponding to the total number of ACEs experienced by the participant.

1.2.2. Adult mental health impairment

1.2.2.1. Self-reported street drug use—Lifetime drug use was defined as responding yes to the question, “Have you ever used street drugs?”

1.2.2.2. Moderate to heavy drinking—Typical weekly alcohol consumption during each of the following age intervals (if applicable) was obtained for each participant: **19–29**, **30–39**, **40–49**, and **50 and older**. Lifetime moderate to heavy drinker status was defined as having consumed 14 or more drinks per week for men and 7 or more drinks per week for women during any of these age periods.

1.2.2.3. Self-reported suicide attempt—Lifetime attempted suicide was determined as a “yes” response to the question “Have you ever attempted to commit suicide?”

1.2.2.4. Self-reported depressed affect—Depressed affect was assessed using the following item from the Diagnostic Interview Schedule: “In the past year, have you had two weeks or more during which you felt sad, blue, or depressed, or lost pleasure in things that you usually cared about or enjoyed?”

1.2.2.5. Sociodemographic covariates—Several sociodemographic covariates were included as adjustment factors in statistical analyses. These factors included educational attainment (less than high school, high school graduate, some college, and college graduate), race/ethnicity (White, Black, Hispanic, Asian, and Other), sex (male, female), age, and marital status (married/cohabitating, widowed/divorced/separated, and never married).

1.3. Statistical analysis

Multiple logistic regression modeling was used to examine the relationship between ACEs and adult mental health outcomes adjusting for age, marriage, educational attainment, race and gender. All analyses were carried out using R version 3.2.2 statistical software (R Core Team, 2015).

2. Results

2.1. ACE score and mental health in adulthood

A series of multiple logistic regression models was specified using self-reported drug use, moderate to heavy drinking, suicide attempts, and depressed affect in adulthood as the dichotomous outcome variables. Each model contained the overall ACE score as the predictor of interest, along with age, race/ethnicity, gender, marital status, and educational attainment as adjustment factors in the model. Results of these models, reflected in Fig. 1, indicate a graded dose-response relationship between the expanded ACE score and the likelihood of experiencing drug use, moderate to heavy drinking, suicide attempts, and depressed affect in adulthood. The odds of respondents experiencing mental health problems in adulthood increased with ACE score.

2.2. Associations with individual ACEs

The adjusted bivariate associations between each ACE and the four mental health problems during adulthood were examined. A summary of these associations are displayed in Table 2. Each ACE except for physical neglect was significantly associated with drug use during adulthood after adjusting for age, race/ethnicity, gender, marital status, and educational attainment. Statistically significant odds ratios were found to range in magnitude from 1.39 (mother treated violently) to 1.88 (emotional abuse).

Each ACE excluding incarcerated household member and parental separation/divorce was significantly associated with moderate to heavy drinking during adulthood after adjusting for age, race/ethnicity, gender, marriage, and educational attainment. Significant odds ratios ranged from 1.33 (household mental illness) to 1.93 (household substance abuse).

All ACEs were found to be positively associated with lifetime attempted suicide reported during adulthood after adjusting for age, race/ethnicity, gender, marriage, and educational attainment. Individuals who reported experiencing emotional abuse during childhood had 5.59 times increased odds of reporting having attempted suicide, making it the largest risk factor among the 11 ACEs tested. The magnitude of the adjusted odds ratios for the remaining ACEs correspond to the following rank order: household mental illness, emotional neglect, physical neglect, sexual abuse, incarcerated household member, physical abuse, mother treated violently, household substance abuse, spanking, parental separation/divorce.

Each ACE except for incarcerated household member was significantly associated with depressed affect during adulthood after adjusting for age, race/ethnicity, gender, marriage, and educational attainment. Significant odds ratios ranged from 1.24 to 1.98. The three strongest associations with depressed affect were found to be household mental illness (OR = 1.98, 95% CI [1.70, 2.29]), emotional abuse (OR = 1.90, 95% CI [1.57, 2.30]), and emotional neglect (OR = 1.84, 95% CI [1.56, 2.16]).

2.3. Multiple logistic regression models

Guided by the results from the adjusted bivariate analyses, fully adjusted logistic models with each of the statistically significant ACE indicators were included along with the sociodemographic factors as predictors of each of the four mental health outcomes were estimated. Adjusted odds ratios for each of these multivariable models can be found in Table 3. Household substance abuse, sexual abuse, spanking, household mental illness, and physical abuse were found to be associated with an increased likelihood of reporting drug abuse when included simultaneously in the model. Sexual abuse, spanking, physical abuse, household substance abuse, and household mental illness were found to be associated with an increased likelihood of engaging in moderate to heavy drinking. Sexual abuse, emotional abuse, spanking, emotional neglect, household mental illness and having an incarcerated family member were found significant predictors of reported suicide attempt. Sexual abuse, physical abuse, household mental illness and substance abuse, and emotional neglect remained significant predictors of experiencing depressed affect in adulthood. Further, the adjusted odds ratios of the significant predictors in each of the multivariable models were greater than 1, suggesting that exposure to multiple ACEs has a cumulative effect on the likelihood of experiencing the mental health outcome of interest.

3. Discussion

In the current paper, we examined the relationship between ACEs and four adult mental health outcomes: drug use, alcohol use, depressed affect, and attempted suicide. The results of our analysis indicated a general dose-response relationship between ACE score and adult mental health problems; as ACE score increased, the odds of experiencing drug and alcohol use, suicide attempts, and depressed affect in adulthood also increased. For example, compared to individuals with no ACEs, individuals reporting six or more ACEs had 2.73 times increased odds of reporting depressed affect during adulthood, 24.36 times increased odds of attempting suicide, 3.73 times increased odds of reporting drug use, and 2.84 times increased odds of reporting moderate to heavy drinking after adjusting for sociodemographic factors. These findings are not unlike previous studies utilizing ACE data to demonstrate associations between ACE score and mental health outcomes (Anda et al., 2002; Chapman et al., 2004); however, we found that over 80% of the sample reported exposure to at least one ACE when we utilized a minimally expanded ACE index that included spanking, demonstrating the pervasiveness of ACEs among youth (see Table 1). These findings suggest that expanded ACE indices have the potential to capture a breadth of diverse experiences that may impact lifelong health and well-being not previously considered by more traditional ACE indices.

In addition to the overall, dose-response relationship, the associations between each ACE and adult mental health outcomes were examined. In the fully adjusted models, each of the ACEs except for physical neglect was significantly associated with drug use during adulthood. Similarly, it was also found that all of the ACEs excluding incarcerated household member and parental separation/divorce was significantly associated with reporting moderate to heavy drinking during adulthood. Those who have experienced childhood adversity may use alcohol and drugs as a coping mechanism. Children who are

exposed to stressful early life experiences may have a difficult time regulating their emotions and resort to drugs and alcohol. Alcohol is often used to alleviate negative mood states (Kassel et al., 2000). Our results corroborate previous studies which have found a strong association between childhood abuse and later substance abuse (Dembo et al., 1992; Kendler et al., 2000). The three strongest single risk factors for drug use and moderate to heavy drinking during adulthood were emotional abuse, household substance abuse, and household mental illness. Furthermore, there was an overall dose-response relationship between ACE score and drug use and drinking.

In adjusted models, each of the ACE categories except for incarcerated household member was significantly associated with depressed affect during adulthood. As with attempted suicide, the three greatest risk factors for depressed affect were also emotional abuse, emotional neglect, and household mental illness (Taillieu, Brownridge, Sareen, & Afifi, 2016). These results align with previous research that identify childhood emotional abuse and emotional neglect as key risk factors for adverse mental health outcomes during adulthood. Spertus, Yehuda, Wong, Halligan, and Seremetis (2003) found that in a sample of women, childhood emotional abuse and neglect were predictive of adult psychological symptoms after controlling for physical and sexual abuse. Furthermore, Bernet and Stein (1999) found that emotional abuse accounted for a significant amount of variance in predicting age of onset of depression and number of depressive symptoms.

Emotional abuse and neglect during childhood can cause significant harm to developmental processes and have a lasting impact on adult mental health (Hildyard & Wolfe 2017). When a child is continuously humiliated, insulted, demeaned, denied affection or isolated—all forms of emotional abuse and neglect—the consequences can be far-reaching (Taillieu et al., 2016). Childhood emotional abuse has previously been linked with eating psychopathology such as bulimia and anorexia nervosa (Kent & Waller, 2000), major depressive disorder and social phobia (Gibb, Chelminski, & Zimmerman, 2007), bipolar disorder (Etain et al., 2010), and a host of other negative mental health outcomes. Cognitive theories, such as the Parental Acceptance-Rejection Theory, predict that emotional abuse affects personality development, as children who face emotional abuse are more likely to have lower self-esteem, a lower sense of self-adequacy, to be emotionally unstable, and to harbor a negative world view (Khaleque & Rohner, 2002; Rohner & Rohner, 1980; Rohner, Khaleque, & Cournoyer, 2005). Though identifying emotional abuse in a clinical setting can be difficult compared to physical or sexual abuse, which have more apparent signs, the importance of assessing forms of emotional abuse in a mental care setting cannot be understated, considering the strong association emotional abuse and neglect have with adult mental health outcomes.

Though household mental illness was one of the main predictors of attempted suicide and depressed affect during adulthood, the role that genetics may play is unclear, as the household member with a mental illness may not necessarily be biologically related to the respondent. In addition, Noh and Turner (1987) notes that living with mentally ill patients can take a psychological toll on family members, which could in turn make them more vulnerable to developing mental health issues themselves. However, since neither the household member nor the respondent were clinically diagnosed, no definitive conclusions

can be drawn regarding the mechanism by which household mental illness was strongly associated with depressed affect and attempted suicide.

Our study provides additional support for the inclusion of expanded categories of ACEs, particularly for the inclusion of spanking in ACE indices. Individuals who reported that they had been spanked were at increased risk of self-reported drug use, moderate to heavy drinking, suicide attempt, and depressed affect in adjusted bivariate models. After adjusting for other forms of childhood maltreatment, spanking was still associated with drug use and moderate to heavy drinking, but no longer significantly associated with depressed affect and suicide attempt. This is likely due to the fact that spanking is strongly associated with other ACE items (Afifi et al., in press). Spanking has previously been linked to physical child abuse (Fréchette, Zoratti, & Romano, 2015; Whipple & Richey, 1997), stressing the importance of examining the interconnections among spanking and other forms of adversity.

In the multivariate analyses, sexual abuse, physical abuse, spanking, household mental illness, and household substance abuse remained significant predictors of lifetime drug use. Childhood sexual abuse, spanking, physical abuse, household mental illness, and household substance abuse remained significant predictors of moderate to heavy drinking. Sexual abuse, emotional abuse, physical abuse, household mental illness, having an incarcerated household member, and emotional neglect remained significant predictors of reported suicide attempt. Sexual abuse, physical abuse, household mental illness and substance abuse, and emotional neglect remained significant for depressed affect. While the impact of ACEs varied depending on the outcome, sexual abuse remained a significant predictor across the board, further highlighting the severity of child sexual abuse on adult outcomes.

These findings indicate that exposure to multiple ACEs in childhood can have a pronounced effect on mental health outcomes. Furthermore, previous research has established the interrelatedness of ACEs: exposure to one form of adversity significantly increases the odds of being exposed to another form of adversity (Dong et al., 2004). Our multivariate models demonstrate a cumulative increase in risk for adult mental health outcomes with each additional ACE experienced. Thus, it is not just that one type of early adversity is a significant risk factor for poorer mental health outcomes in adulthood, but that each additional type of adversity may heighten adult risk above and beyond the risk conferred by one ACE alone.

3.1. Limitations

There are several limitations that should be considered in the interpretation of the data. All ACE data were self-reported and retrospectively collected. Due to the cross-sectional retrospective nature of this study, no causal interpretations can be made; only associations between ACEs and health outcomes can be established. It is possible that respondents who have current physical or mental health issues may be more likely to report ACEs. Though the ACE module includes vital information regarding the kinds of childhood adversity experienced, the severity, frequency, chronicity, and timing of childhood adversity were not accessed. In addition, the ACE module utilized in the CDC-Kaiser study primarily focuses on adversities that occur in the home and does not capture a complete array of adversities outside of the home in the broader environmental context. Including witnessing community

violence, poverty, peer victimization, exposure to war, and other forms of adversity into the ACE module could deepen our understanding. The fact that various forms of childhood adversity were not included in the module and the sensitive nature of the both the exposures (Adverse Childhood Experiences) and the outcomes (drug use and mental health conditions) in our analysis mean that it is likely that both the exposure and outcomes were underreported, which could potentially bias our results (Rothman, Greenland, & Lash, 2008). Furthermore, drug use and mental health conditions were based on a single measure, possibly failing to reliably capture the complexity of these outcomes.

The generalizability of these data may be affected by a few factors. The study population consisted of adult HMO members from Southern California who were primarily white, educated, and upper-middle class. As older people are more likely to attend a primary health clinic, there was an overrepresentation of older respondents. Furthermore, the CDC-Kaiser study was conducted over twenty years ago during 1995–1997. Thus, these results may not be generalizable to other populations. However, despite these caveats, the CDC-Kaiser study is one of few high-quality studies to examine the relationship between ACEs and adult health outcomes.

3.2. Implications

In conclusion, our results stress the importance of examining the effects of both cumulative ACE scores and individual ACE categories on adult health outcomes to provide a more complete picture of childhood adversity, as viewing either independently is insufficient. It is imperative that practitioners and researchers recognize how different forms of childhood adversity are deeply intertwined. Understanding how different forms of childhood adversity individually and additively influence health outcomes can elucidate key risk factors and protective factors. Though we know that adverse health experiences can have deleterious health and behavioral consequences, it is important to stress that ACEs are neither deterministic nor inevitable; ACEs can be prevented. The Centers for Disease Control and Prevention (CDC) recently developed and released a technical package that compiles the best available evidence on the prevention of child abuse and neglect that may be a useful tool in prioritizing prevention efforts, specifically with regard to norms change, programs, and policies (Fortson, Kleven, Merrick, Gilbert, & Alexander, 2016). Developing safe, stable, nurturing relationships and fostering positive environments can play a key role in preventing early adverse experiences and overcoming the harmful effects of early adversity (CDC, 2014).

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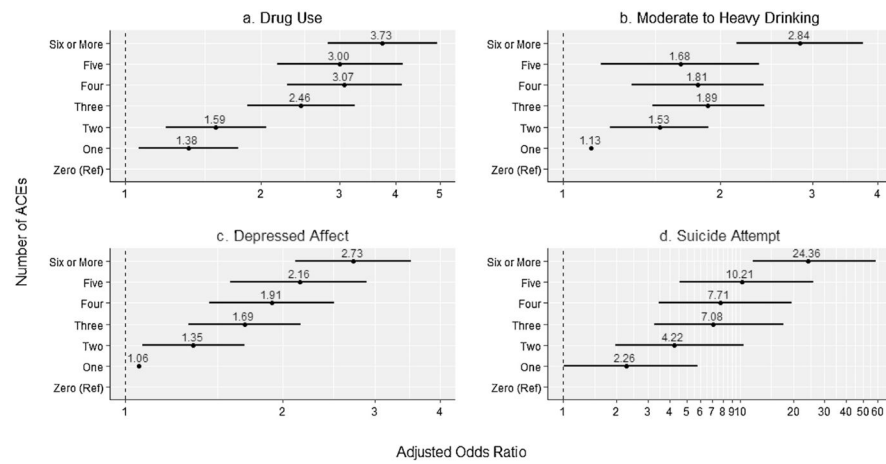


Fig. 1.
Adjusted associations of adult mental health outcomes with ACE Score..

Table 1

Demographic Composition and ACE Prevalence by Gender.

| | Women (N = 3484) | Men (N = 3981) | Total (N = 7465) |
|-----------------------------------|------------------|----------------|------------------|
| Race/Ethnicity | | | |
| White | 2670 (76.6) | 2945 (74.0) | 5615 (75.2) |
| Black | 138 (4.0) | 169 (4.2) | 307 (4.1) |
| Hispanic | 348 (10.0) | 449 (11.3) | 797 (10.7) |
| Asian | 227 (6.5) | 339 (8.5) | 566 (7.6) |
| Other race or ethnicity | 101 (2.9) | 79 (2.0) | 180 (2.4) |
| Education | | | |
| Less than high school | 211 (6.1) | 268 (6.7) | 479 (6.4) |
| High school diploma or equivalent | 414 (11.9) | 674 (16.9) | 1088 (14.6) |
| Some college/technical school | 1346 (38.6) | 1680 (42.2) | 3026 (40.5) |
| College graduate | 1513 (43.4) | 1359 (34.1) | 2872 (38.5) |
| Marital Status | | | |
| Married/Cohabiting | 2772 (80.3) | 2648 (67.1) | 5420 (73.2) |
| Widowed/Divorced/Separated | 422 (12.2) | 992 (25.1) | 1414 (19.1) |
| Never married | 260 (7.5) | 307 (7.8) | 567 (7.7) |
| Adverse Childhood Experiences | | | |
| Sexual Abuse | 591 (17.0) | 945 (23.7) | 1536 (20.6) |
| Emotional Abuse | 260 (7.5) | 467 (11.7) | 727 (9.7) |
| Physical Abuse | 974 (28.0) | 977 (24.5) | 1951 (26.1) |
| Spanking | 2134 (61.3) | 1959 (49.2) | 4093 (54.8) |
| Household Mental Illness | 503 (14.4) | 999 (25.1) | 1502 (20.1) |
| Incarcerated Household Member | 167 (4.8) | 273 (6.9) | 440 (5.9) |
| Emotional Neglect | 433 (12.4) | 650 (16.3) | 1083 (14.5) |
| Physical Neglect | 380 (10.9) | 334 (8.4) | 714 (9.6) |
| Mother Treated Violently | 409 (11.7) | 521 (13.1) | 930 (12.5) |
| Household Substance Abuse | 898 (25.9) | 1214 (30.5) | 2112 (28.3) |
| Parental Separation/Divorce | 787 (22.6) | 1000 (25.1) | 1787 (23.9) |
| ACE Score | | | |
| 0 | 596 (17.1) | 819 (20.6) | 1415 (19.0) |
| 1 | 970 (27.8) | 987 (24.8) | 1957 (26.2) |
| 2 | 786 (22.6) | 755 (19.0) | 1541 (20.6) |
| 3 | 452 (13.0) | 440 (11.1) | 892 (11.9) |
| 4 | 270 (7.7) | 318 (8.0) | 588 (7.9) |
| 5 | 163 (4.7) | 242 (6.1) | 405 (5.4) |
| 6 | 110 (3.2) | 162 (4.1) | 272 (3.6) |
| 7 | 61 (1.8) | 105 (2.6) | 166 (2.2) |
| 8 | 42 (1.2) | 71 (1.8) | 113 (1.5) |
| 9 | 22 (0.6) | 58 (1.5) | 80 (1.1) |
| 10 | 10 (0.3) | 21 (0.5) | 31 (0.4) |

| | Women (N = 3484) | Men (N = 3981) | Total (N = 7465) |
|----|------------------|----------------|------------------|
| 11 | 2 (0.1) | 3 (0.1) | 5 (0.1) |

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Table 2

Adjusted bivariate associations between self-reported mental health outcomes and ACEs.

| Self-reported Mental Health Outcome | | | | | | | | |
|-------------------------------------|----------------------------------|-------------------|--|-------------------|---|-------------------|--|-------------------|
| | Drug Use (lifetime) ^a | | Moderate to Heavy Drinking (past 12 months) ^b | | Suicide Attempt (lifetime) ^a | | Depressed Affect (past 12 months) ^a | |
| | OR _{adj} | CI _{95%} | OR _{adj} | CI _{95%} | OR _{adj} | CI _{95%} | OR _{adj} | CI _{95%} |
| ACE Exposure | | | | | | | | |
| Sexual Abuse | 1.75 | 1.49, 2.04 | 1.52 | 1.29, 1.78 | 3.63 | 2.78, 4.74 | 1.44 | 1.24, 1.67 |
| Emotional Abuse | 1.88 | 1.55, 2.28 | 1.46 | 1.15, 1.83 | 5.59 | 4.22, 7.37 | 1.90 | 1.57, 2.30 |
| Physical Abuse | 1.75 | 1.51, 2.01 | 1.48 | 1.27, 1.72 | 2.89 | 2.22, 3.77 | 1.67 | 1.45, 1.92 |
| Physical neglect | 1.20 | 0.95, 1.51 | 1.54 | 1.23, 1.92 | 3.73 | 2.71, 5.09 | 1.34 | 1.09, 1.65 |
| Emotional neglect | 1.73 | 1.45, 2.05 | 1.39 | 1.15, 1.68 | 4.11 | 3.13, 5.39 | 1.84 | 1.56, 2.16 |
| Mother treated violently | 1.39 | 1.15, 1.67 | 1.34 | 1.08, 1.64 | 2.51 | 1.86, 3.37 | 1.33 | 1.10, 1.59 |
| Household mental illness | 1.76 | 1.51, 2.06 | 1.33 | 1.12, 1.57 | 5.42 | 4.13, 7.15 | 1.98 | 1.70, 2.29 |
| Incarcerated household member | 1.57 | 1.22, 2.02 | 1.33 | 0.99, 1.77 | 2.93 | 2.02, 4.16 | 1.17 | 0.90, 1.50 |
| Household substance abuse | 1.82 | 1.59, 2.10 | 1.93 | 1.66, 2.25 | 2.26 | 1.72, 2.96 | 1.50 | 1.30, 1.72 |
| Parental separation/divorce | 1.47 | 1.27, 1.70 | 1.14 | 0.96, 1.34 | 1.72 | 1.30, 2.26 | 1.25 | 1.08, 1.45 |
| Spanking | 1.63 | 1.42, 1.88 | 1.40 | 1.22, 1.61 | 2.20 | 1.65, 2.97 | 1.24 | 1.08, 1.41 |

^a Adjustment factors included in the model: age, race, sex, educational attainment, and marital status.^b Adjustment factors included in the model: age, race, educational attainment, and marital status (note: heavy drinking status is based upon the gender of the respondent and therefore sex was omitted from the model).

Table 3

Multivariate associations between self-reported mental health outcomes and ACEs.

| Self-reported Mental Health Outcome | | | | | | | | |
|-------------------------------------|----------------------------------|-------------------|--|-------------------|---|-------------------|--|-------------------|
| | Drug Use (lifetime) ^a | | Moderate to Heavy Drinking (past 12 months) ^b | | Suicide Attempt (lifetime) ^a | | Depressed Affect (past 12 months) ^a | |
| | OR _{adj} | CI _{95%} | OR _{adj} | CI _{95%} | OR _{adj} | CI _{95%} | OR _{adj} | CI _{95%} |
| ACE Exposure | | | | | | | | |
| Sexual Abuse | 1.48 | 1.26, 1.74 | 1.35 | 1.14, 1.59 | 2.31 | 1.72, 3.08 | 1.18 | 1.01, 1.38 |
| Emotional Abuse | | | | | 2.27 | 1.62, 3.19 | | |
| Physical Abuse | 1.29 | 1.10, 1.51 | 1.19 | 1.01, 1.40 | | | 1.33 | 1.14, 1.54 |
| Physical neglect | | | | | | | | |
| Emotional neglect | | | | | 1.65 | 1.19, 2.28 | 1.38 | 1.15, 1.65 |
| Mother treated violently | | | | | | | | |
| Household mental illness | 1.42 | 1.21, 1.67 | | | 3.41 | 2.55, 4.58 | 1.65 | 1.41, 1.93 |
| Incarcerated household member | | | | | 1.50 | 1.01, 2.19 | | |
| Household substance abuse | 1.55 | 1.34, 1.80 | 1.82 | 1.56, 2.12 | | | 1.23 | 1.06, 1.43 |
| Parental separation/Divorce | | | | | | | | |
| Spanking | 1.42 | 1.22, 1.65 | 1.29 | 1.11, 1.49 | 1.39 | 1.02, 1.92 | | |

^a Adjustment factors included in the model: age, race, sex, educational attainment, and marital status.^b Adjustment factors included in the model: age, race, educational attainment, and marital status (note: heavy drinking status is based upon the gender of the respondent and therefore sex was omitted from the model).